REMARKS

Applicants previously presented claims 1-3, 5-16, 18-22, 24, 25 and 27 for examination. The above-identified Office Action has rejected all of the claims. By this amendment, Applicants have amended claims 1, 16 and 27 to further clarify the subject matter regarded as the invention. Accordingly, claims 1-3, 5-16, 18-22, 24, 25 and 27 remain pending. Applicants respectfully request that the Examiner reconsider the application in light of the amendments and the remarks expressed herein.

112 Rejections

Claims 1-3, 5-16, 18-22, 24, 25 and 27 were rejected under 35 U.S.C. 112, first paragraph, as allegedly failing to comply with the enablement requirement. The Office Action incorrectly asserted that:

> "Claims 1, 16, and 27 recited increasing the frequency of an ultrasonic signal and the beam width increases. This feature is not enabled since the prior art teaches that as the frequency increases, the beam width decreases .... In the remarks filed 3/18/09, applicant provides an explanation for the unexpected results, however the reasons for the results recited by applicant (i.e. an increase in frequency results in an increase in beam width) are not apparent from applicant's explanation. For example, it is not apparent how Equation 20 in 'Equations of nonlinear acoustics,' by V.P. Kuznetsov (see IDS filed 1/21/05), cited by applicant in the remarks, relates to the frequency and beam width of an ultrasonic signal."

It appears the Examiner erroneously asserted that Equation 20 was not related to the frequency and beam width components of an ultrasonic signal. Also, the concept of increasing the frequency of an ultrasonic signal leading to an increase in beam width is still not understood or accepted by the Examiner. Applicants submit that paragraphs 89 and 90, together with FIGs. 9E-9G, in the

specification, are sufficient to fully explain and support Applicants' claimed invention.

In any event, Applicants will attempt to explain the concepts again. Equation 20, as an example, can be used to describe the propagation characteristics of a non-linear acoustic beam in various media. Such equation can be numerically integrated (numerical integration methods should be obvious to those skilled in the art) for an audible acoustic signal modulating an ultrasonic carrier signal, to obtain the self-demodulation of the ultrasonic signal in a non-linear medium, such as air. Via such numerical integration techniques, the pressure field distribution of the demodulated acoustic wave as a distance from the source of the ultrasonic signal can be obtained. The beam width of the acoustic wave can be computed from the pressure field distribution for an ultrasonic carrier frequency. As disclosed in the specification, the beam width depends on the ultrasonic carrier frequency at least due to the non-linear dissipative effect of air. Such effects are represented, for example, by the parameter b or b' in Equation 20. As an example, the demodulated acoustic beam width increases with increasing ultrasonic carrier frequency, such as from 40 kHz to 200 kHz, as depicted in FIGs. 9E to 9G of the specification.

In view of the specification and the above explanation, Applicants request that the 112 rejection be reconsidered and withdrawn.

103 Rejection

- Claims 1-3, 5, 7, 9, 13, 16, 18, 20, 22, 24 and 27 were rejected under 35 U.S.C. 103(a) as being unpatentable over Pompei (US Pub. No. 2001/0007591 A1) in view of Takahashi et al. (US Pat. No. 6,643,377, hereinafter "Takahashi");
- claims 6, 19 and 21 were rejected under 35 U.S.C. 103(a) as being unpatentable over Pompei in view of Takahashi in further view of Kuriyama et al. (JP Pub. No. 1-109898, hereinafter Kuriyama);

- claims 8 and 25 were rejected under 35 U.S.C. 103(a) as being unpatentable over Pompei in view of Takahashi in further view of Norris et al. (US Pub. No. 2004/0052387 A1, hereinafter referred to as "Norris");
- claims 10 and 12 were rejected under 35 U.S.C. 103(a) as being unpatentable over Pompei in view of Takahashi in further view of Wiser et al. (US Pub. No. 2003/0009248 A1, hereinafter "Wiser");
- claim 11 was rejected under 35 U.S.C. 103(a) as being unpatentable over Pompei in view of Takahashi in further view of Wiser and in further view of Brain (Brain; Marshall, How USB Ports Work, October 11, 2002, www.howstuffworks.com/usb);
- claim 14 was rejected under 35 U.S.C. 103(a) as being unpatentable over Pompei in view of Takahashi in further view of Kurlyama, and in further view of Tokumo et al. (US Patent No. 4,476,571, hereinafter "Tokumo"); and
- claim 15 was rejected under 35 U.S.C. 103(a) as being unpatentable over Pompei in view of Takahashi in further view of Tanaka et al. (US Pat. No. 4,823,908, hereinafter "Tanaka").

Applicants respectfully disagree with all of the rejections.

Independent Claims

To reject the independent claims 1, 16 and 27, the Office Action relied on Pompei and Takahashi.

The Office Action incorrectly asserted that in Pompei, "the attribute controls the width of the beam of the audio output by controlling the ultrasonic frequency of the ultrasonic signals (ultrasonic beams with different frequencies, [0039]) so that if the ultrasonic frequency is increased, the attenuation and the width of the beam are also increased (if the natural result of the increasing the ultrasonic frequency is an increase in attenuation and beam width then the relationship is inherent in the apparatus of Pompei)."

In its paragraph 39, Pompei teaches that a "phased array may be used to vary audio beam characteristics such as the beam width, focus, and spread." A standard phased array uses a single frequency to generate multiple outputs with different phases. When the multiple outputs are combined, different characteristics of the output beam can be changed, such as the beam width, as taught by Pompei. However, such phased array is based on a single frequency.

In its paragraph 39, Pompei also teaches that "the phased array may be used to generate a frequency-dependent beam distribution, in which modulated ultrasonic beams with different frequencies propagate through the air along different projection path." Here Pompei teaches using the phased array to generate multiple beams with different frequencies to propagate in different directions. There is no teaching or suggestion in Pompei of changing frequency to change beam width. Applicants challenge the Patent Office to find any prior art that predicts changing the beam shape by changing the carrier frequency based on the standard working principle of a phased array.

Though Pompei has taught changing the frequency to change the direction of a beam, Pompei has not taught or suggested anywhere in its patent the idea of changing the ultrasonic frequency to change the beam width.

Moreover, in Pompei, the frequency of the carrier signal is on the order of 45 kHz to 55 kHz or higher (paragraph 24), while Pompei's acoustic transducer array (which is typically different from a phased array), with the same center frequency as the carrier signal, has a bandwidth on the order of 5 kHz to 10 kHz or higher (paragraph 30).

Thus, not only has Pompei not taught or suggested increasing the ultrasonic frequency to broaden the beam, Pompei also has not taught or suggested the ultrasonic frequency can be changed by more than 50% to change the beam width, as claimed.

In addition, Pompei has not taught or suggested a directional speaker that outputs an ultrasonic output to a desired distance for a user based on an ultrasonic signals, wherein

- the width of the beam of the audio output is controlled by controlling the ultrasonic frequency of the ultrasonic signals so that
- if the ultrasonic frequency is increased, the attenuation and the width of the beam are also increased,
- with the power level of the beam being increased based on the desired distance.

The Office Action admitted that Pompei does not teach the ultrasonic frequency being controlled by selecting a carrier frequency from a predetermined set of carrier frequencies. But the Office Action incorrectly argued that it would have been obvious "to provide a predetermined set of carrier frequencies for driving the various transducers in order to match ultrasonic carrier frequencies with the center frequency of each transducer since it is disclosed that the center frequencies of individual transducers span a desired frequency range (Pompei, [0060]) and that the center frequency of the transducer and the ultrasonic carrier frequency are preferably the same value (Pompei, [0037])."

In its paragraph 60, Pompei is teaching a transducer array, not a phased array. It is an array with grooves of different geometries. Each groove can be considered as a transducer generating a different frequency. This transducer array can generate outputs along multiple paths based on multiple frequencies. Again, there is no teaching or suggestion of changing the frequency to change the beam width, let alone the frequency is controlled by selecting a carrier frequency from a predetermined set of carrier frequencies.

The Office Action also admitted that Pompei does not teach the limitation of a device that receives incoming encoded signals and provides decoded audio signals for use by the system, and that Pompei does not teach or suggest the feature of a beam-attribute control unit receiving wireless inputs form a user via an electronic device to control the attribute. To remedy the deficiencies, the Office Action brought in Takahashi.

Initially, it is submitted that there is no motivation to combine Pompei and Takahashi in the manner that the Office Action proposes. Even if combining the two references were appropriate, which Applicants respectfully disagree, the above-noted many serious deficiencies of Pompei remain.

Based on the foregoing, it is submitted that independent claims 1, 16 and 27 are patentably distinct from Pompei and Takahashi.

Dependent claims

Regarding dependent claims 2-3, 5-15, 18-22, 24 and 25, in addition to Pompei and Takahashi, to reject them, the Office Action relied on Kuriyama, Norris, Wiser, Brain, Tokumo, and Tanaka.

Again, it is submitted that there is no motivation to combine Pompei, Takahashi, Kuriyama, Norris, Wiser, Brain, Tokumo, and Tanaka, singly or in any combination, in the manner that the Office Action proposes. Even if combining the references were appropriate, which Applicants respectfully disagree, the above-noted many serious deficiencies of Pompei remain.

Based on the foregoing, it is submitted that the claims 1-3, 5-16, 18-22, 24, 25 and 27 are patentably distinct from all the cited references. Further the independent or the dependent claims recite additional elements which when taken in the context of the claimed invention further patentably distinguish the art of record. The additional limitations recited in the independent claims or the dependent claims are not further discussed as the above-discussed limitations are clearly sufficient to distinguish the claimed invention from the cited references. Thus, it is respectfully requested that the Examiner withdraw the rejection of claims 1-3, 5-16, 18-22, 24, 25 and 27 under 35 USC §103(a).

Summary

It is submitted that claims 1-3, 5-16, 18-22, 24, 25 and 27 are patentably distinct from the cited references. Reconsideration of the application and an early Notice of Allowance are earnestly solicited.

In the event that the Examiner, upon reconsideration, determines that an action other than an allowance is appropriate, the Examiner is requested and authorized to telephone Applicants' representative below prior to taking such action, if the Examiner feels that such a telephone call will advance the prosecution of the present application.

Respectfully submitted,

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